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EXAMINER	
TRUONG, CAM Y T	

ART UNIT	PAPER NUMBER
2162	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/702,367	BULTMAN, DAVID C.	
	Examiner	Art Unit	
	Cam Y T. Truong	2162	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *13 April 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-34* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-34* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. Applicant has amended claims 1-27, 29, 32, 33 in the amendment filed on 4/13//2007. Claims 1-34 are pending in this Office Action. This Office Action is Final Office Action.

Response to Arguments

2. Applicant's arguments with respect to claims 1-34 have been considered but are moot in view of the new ground(s) of rejection.

Applicant argued that claims 32-34 are statutory. However, Claims 33-34 are non statutory because the claims lack the necessary physical articles or objects to constitute a machine or a manufacture within the meaning of 35 USC 101. They are clearly not a series of steps or acts to be a process nor are they a combination of chemical compounds to be a composition of matter. As such, they fail to fall within a statutory category. They are, at best, functional descriptive material *per se*.

Applicant argued that cited reference do not teach "separately from the rood node, index nodes and leaf nodes".

In response to applicant's argument, claims are rejected in a new ground of rejection.

Claim Rejections - 35 USC § 101

3. 35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

4. Claims 33-34 are rejected under 35 U.S.C. 101 because the claims lack the necessary physical articles or objects to constitute a machine or a manufacture within the meaning of 35 USC 101. They are clearly not a series of steps or acts to be a process nor are they a combination of chemical compounds to be a composition of matter. As such, they fail to fall within a statutory category. They are, at best, functional descriptive material *per se*.

Descriptive material can be characterized as either "functional descriptive material" or "nonfunctional descriptive material." Both types of "descriptive material" are nonstatutory when claimed as descriptive material *per se*, 33 F.3d at 1360, 31 USPQ2d at 1759. When functional descriptive material is recorded on some computer-readable medium, it becomes structurally and functionally interrelated to the medium and will be statutory in most cases since use of technology permits the function of the descriptive material to be realized. Compare *In re Lowry*, 32 F.3d 1579, 1583-84, 32 USPQ2d 1031, 1035 (Fed. Cir. 1994)

Merely claiming nonfunctional descriptive material, i.e., abstract ideas, stored on a computer-readable medium, in a computer, or on an electromagnetic carrier signal, does not make it statutory. See *Diehr*, 450 U.S. at 185-86, 209 USPQ at 8 (noting that the claims for an algorithm in *Benson* were unpatentable as abstract ideas because "[t]he sole practical application of the algorithm was in connection with the programming of a general purpose computer.").

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 1, 3, 5-10, 11-34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hara (US 6571250) in view of Bredenberg (US 5918224).

As to claim 1, Hara teaches a memory for storing information related to a B tree structure, wherein the B tree structure is used to access data records from a database system, wherein a set of the data records have duplicate keys (col. 4, lines 15-30):

"a plurality of interconnected nodes having a root node, index nodes and leaf nodes" as (col. 4, lines 15-30);

"wherein a leaf node is configured to store a first key corresponding to first data in a first data page" as (col. 4, lines 30-45);

"wherein data pages store a second key and a third key" as (col. 11, lines 25-30).

"wherein the second key and the third key that are stored on the data pages are duplicate keys of the first key that is stored in the leaf node" as shown in fig. 11, a node number 4 is used to store a third key 28 that is a duplicate of the first key 28 of Node number 1 and that corresponds to data p3&p4. The node number 4 is represented as the second data (fig. 11, col. 2, lines 49-55);

"whereby the first, second and third keys are used for searching the set of data records" as (col. 5, lines 1-18; col. 6, lines 53-67; col. 7, lines 1-10).

Hara does not explicitly teach the claimed limitation "separately from the root node, index node and leaf node; wherein the first key points to the second key; wherein the second key points to the third key".

Bredenberg teaches storing data pages 810 which comprise a table separately from nodes of a B-tree (col. 30,lines 34-45; 29, lines 32-45). Key or pointer of node 601 points to key of node 603 and key of 603 points to key of 601 (fig. 6; col. 8, lines 10-65).

It would have been obvious to a person of an ordinary skill in the art at the time the invention was made to apply Bredenberg's teaching of storing data pages 810 which comprise a table separately from nodes of a B-tree. Key or pointer of node 601 points to key of node 603 and key of 603 points to key of 601 to Hara's system in order to avoid a deadlock from occurring with a transaction structurally modifying the arrangement of records in the tree during searching/retrieving records in a tree, save memory space, provide a fast method by using forward operations of linked keys for searching/retrieving records in a database and further to permit a B-tree to be concurrently traversed for the purpose of reading while the B-tree is actually in the process of restructuring.

As to claim 3, Hara teaches the claimed limitation "wherein the data pages include the first data page having the second key and a second data page having the third key, wherein said first data page and second data page comprise different pages" as (fig. 10).

As to claim 5, Hara teaches the claimed limitation "wherein the data pages include the first data page having the second key and second data page having the third key, wherein the second data page includes second data, wherein said first data and second data are different" as (figs. 10&11).

As to claim 6, Hara teaches the claimed limitation "wherein the data pages include the first page having the second key and a second key and second data page having third key, whrein the second data page includes second data, wherein said first data has variable length" as (col. 10, lines 55-63; figs. 10&11).

As to claim 7, Hara teaches the claimed limitation "wherein said second data has variable length" as (col. 10, lines 55-63).

As to claim 8, Hara teaches the claimed limitation "wherein degree of the leaf nodes is not substantially affected by the variable length of the first and second data" as (col. 4, lines 32-43).

As to claim 9, Hara teaches the claimed limitation "wherein degree of the leaf nodes is not substantially affected because the first and second data are stored separate from the leaf nodes" as (col. 4, lines 32-43).

As to claim 10, Hara teaches the claimed limitation "wherein said plurality of leaf nodes are maintained in sequential order" as (fig. 9).

Hara does not explicitly teach the claimed limitation with a doubly linked list which connects each of said leaf node with its sibling nodes".

Bredenberg teaches a doubly linked list which connects each leaf node with its sibling nodes (figs. 6-7, col. 28, lines 5-25)

It would have been obvious to a person of an ordinary skill in the art at the time the invention was made to apply Bredenberg's teaching of a doubly linked list which connects each leaf node with its sibling nodes to Hara's system in order to permit a B-tree to be concurrently traversed for the purpose of reading while the B-tree is actually in the process of restructuring.

As to claim 11, Hara teaches the claimed limitation "wherein the B-tree is configured to operate with a find operation" as (col. 6, lines 25-45).

As to claim 12, Hara teaches the claimed limitation "wherein the B-tree is configured to operate with a find-next operation" as (col. 6, lines 25-45).

As to claim 13, Hara teaches the claimed limitation "wherein the B-tree is configured to operate with a find-previous operation" as (fig. 5).

As to claim 14, Hara teaches the claimed limitation "wherein the B-tree is configured to operate with a find-first operation" as (fig. 5).

As to claim 15, Hara teaches the claimed limitation "wherein the B-tree is configured to operate with a find-last operation" as (fig. 5).

As to claim16, Hara teaches the claimed limitation "wherein the B-tree is configured to operate with an insert operation" as (col. 7, lines 55-56).

As to claim 17, Hara teaches the claimed limitation "wherein the B-tree is configured to operate with a delete operation" as (col. 12, lines 10-15).

As to claim 18, Hara teaches the claimed limitation "wherein data associated with the first and second keys are stored separate from the leaf nodes" as (col. 4 lines 15-30).

As to claim 19, Hara teaches the claimed limitation "wherein the first and second keys each have a corresponding unique data record value" as (col. 11, lines 25-30).

As to claim 20, Hara teaches the claimed limitation "wherein substantially concurrently executing processes update the first and second keys at approximately the same time without being locked out by another process because their associated data is stored on different data pages" as (col. 11, lines 15-25).

As to claim 21, Hara teaches the claimed limitation "wherein the processes are threads" as (col. 11, lines 15-25).

As to claim 22, Hara teaches the claimed limitation "wherein the data pages include the first data page having the second key and a second data page having the third key, wherein the second data page includes second data. Wherein page and offset for the second key's value follow the second data on the second data page" as (figs. 10&11; col. 2, lines 58-67; col. 3, lines 1-5).

As to claim 23, Hara teaches the claimed limitation "wherein each page has associated with it a lock handle, wherein because the B-tree is self-balancing, an insert operation to the B-tree avoids locking the entire B-tree or subtree" as (col. 2, lines 58-67; col. 3, lines 1-5).

As to claim 24, Hara teaches the claimed limitation "wherein the leaf nodes contain more than two key-value entries" as (fig. 11).

As to claim 25, Hara teaches the claimed limitation ""whrein the data pages include the first data page having the second key and a second data page having the third key, whrein the second data page includes second data, wherein the second key points to third data stored on a third data page" as (figs. 1 & 11; col. 15, lines 1-30; col. 8, lines 55-67).

As to claim 26, Hara teaches the claimed limitation "third data stored on the second data page" as (fig. 1, col. 15, lines 1-30; col. 8, lines 55-67).

As to claim 27, Hara teaches the claimed limitation computer-implemented method for concurrent execution of a plurality of transactions in a database system containing a plurality of data records, wherein a set of the data records have duplicate keys, said method comprising (fig. 1, col. 4, lines 15-30):

"storing said plurality of data records in a B* tree structure with a plurality of index nodes and a plurality of leaf nodes" as (fig. 1, col. 4, lines 15-30);

"wherein a leaf node is configured to store a first key corresponding to first data in a first data page" as (col. 11, lines 25-30; col. 4, lines 15-30);

"wherein data pages store a second key and a third key; wherein the second key and the third key that are stored on the data pages are duplicate keys of the first key that is stored in the leaf node " as the data store a duplicated key that corresponding to data of another page. The data includes a second pointer (col. 11, lines 25-30). as shown in fig. 11, a node number 4 is used to store a third key 28 that is a duplicate of the first key 28 of Node number 1 and that corresponds to data p3&p4. The node number 4 is represented as the second data (fig. 11, col. 2, lines 49-55);

"implementing said plurality of transactions by concurrently locating and operating on the target data records stored in said data pages through use of said B* tree structure" as (fig. 1, col. 8, lines 55-67).

Hara does not explicitly teach the claimed limitation "separately from the root node, index node and leaf node; wherein the first key points to the second key; wherein the second key points to the third key".

Bredenberg teaches storing data pages 810 which comprise a table separately from nodes of a B-tree (col. 30,lines 34-45; 29, lines 32-45). Key or pointer of node 601 points to key of node 603 and key of 603 points to key of 601 (fig. 6; col. 8, lines 10-65).

It would have been obvious to a person of an ordinary skill in the art at the time the invention was made to apply Bredenberg's teaching of storing data pages 810 which comprise a table separately from nodes of a B-tree. Key or pointer of node 601 points to key of node 603 and key of 603 points to key of 601 to Hara's system in order to avoid a deadlock from occurring with a transaction structurally modifying the arrangement of records in the tree during searching/retrieving records in a tree, save memory space, provide a fast method by using forward operations of linked keys for searching/retrieving records in a database and further to permit a B-tree to be concurrently traversed for the purpose of reading while the B-tree is actually in the process of restructuring.

As to claim 28, Hara teaches the claimed limitation "wherein said step of implementing said plurality of transactions further includes implementing a concurrency control protocol" as (col. 8, lines 40-45).

As to claim 29, Hara teaches the claimed limitation "wherein th data pages include the firs data page having the second key and a second data page having the third key, wherein the scond data page include second data, wherein the concurrency control protocol controls a first of said transactions to access the first data in the first

data page and concurrently a second of said transactions to access the second data in the second data page, wherein said first data and second data have the same key" as (col. 11, lines 15-30; col.8, lines 55-67).

As to claim 30, Hara teaches the claimed limitation "wherein the concurrency control protocol is a lock-based protocol" as (col. 1, lines 30-50).

As to claim 31, Hara teaches the claimed limitation "wherein the lock-based protocol releases locks on index nodes and leaf nodes when the data page is identified" as (col. 1, lines 30-50).

As to claim 32, Hara teaches the claimed limitation a computer-readable medium for concurrent execution of a plurality of transactions in a database system containing a plurality of data records, wherein a set of the data records have duplicate keys, comprising instructions for (fig. 1, col. 4, lines 15-30):

"storing said plurality of data records within a B* tree structure that has a plurality of index nodes and a plurality of leaf nodes" as (fig. 1, col. 4, lines 15-30);

"wherein a leaf node is configured to store a first key corresponding to first data in a first data page" as (col. 11, lines 25-30; col. 4, lines 15-30);

"wherein data pages store a second key and a third key; wherein the second key and the third key that are stored on the data pages are duplicate keys of the first key that is stored in the leaf node " as the data store a duplicated key that corresponding to

data of another page. The data includes a second pointer (col. 11, lines 25-30). as shown in fig. 11, a node number 4 is used to store a third key 28 that is a duplicate of the first key 28 of Node number 1 and that corresponds to data p3&p4. The node number 4 is represented as the second data (fig. 11, col. 2, lines 49-55);

"implementing said plurality of transactions by concurrently locating and operating on the target data records stored in said data pages through use of the first, second and third keys by a data searching system" as (fig. 1, col. 8, lines 55-67).

"wherein the second data is configured to store a third key that is a duplicate of the first key and that corresponds to third data" as shown in fig. 11, a node number 4 is used to store a third key 28 that is a duplicate of the first key 28 of Node number 1 and that corresponds to data p3&p4. The node number 4 is represented as the second data (fig. 11, col. 2, lines 49-55);

Hara does not explicitly teach the claimed limitation "separately from the root node, index node and leaf node; wherein the first key points to the second key; wherein the second key points to the third key".

Bredenberg teaches storing data pages 810 which comprise a table separately from nodes of a B-tree (col. 30,lines 34-45; 29, lines 32-45). Key or pointer of node 601 points to key of node 603 and key of 603 points to key of 601 (fig. 6; col. 8, lines 10-65).

It would have been obvious to a person of an ordinary skill in the art at the time the invention was made to apply Bredenberg's teaching of storing data pages 810 which comprise a table separately from nodes of a B-tree. Key or pointer of node 601 points to key of node 603 and key of 603 points to key of 601 to Hara's system in order to

avoid a deadlock from occurring with a transaction structurally modifying the arrangement of records in the tree during searching/retrieving records in a tree, save memory space, provide a fast method by using forward operations of linked keys for searching/retrieving records in a database and further to permit a B-tree to be concurrently traversed for the purpose of reading while the B-tree is actually in the process of restructuring.

As to claim 33, Hara teaches the claimed limitations:

" a data store to store a plurality of data records with a first set of data records having duplicate keys, said plurality of data records stored in a B* tree structure with a plurality of index nodes and a plurality of leaf nodes" as (fig. 1, col. 4, lines 15-30);

""wherein a leaf node is configured to store a first key corresponding to first data in a first data page" as (col. 11, lines 25-30; col. 4, lines 15-30);

"wherein data pages store a second key and a third key; wherein the second key and the third key that are stored on the data pages are duplicate keys of the first key that is stored in the leaf node " as the data store a duplicated key that corresponding to data of another page. The data includes a second pointer (col. 11, lines 25-30). As shown in fig. 11, a node number 4 is used to store a third key 28 that is a duplicate of the first key 28 of Node number 1 and that corresponds to data p3&p4. The node number 4 is represented as the second data (fig. 11, col. 2, lines 49-55);

"whereby a plurality of transactions are implemented a plurality of transactions by concurrently locating and operating on the data records stored in the data pages through use of the B* tree structure by a data searching system" as (col. 1, lines 30-50);

"a concurrency-control manager for implementing a concurrency control protocol through use of the B* tree structure" as (col. 8, lines 40-45; col. 11, lines 15-25).

"wherein the second data is configured to store a third key that is a duplicate of the first key and that corresponds to third data" as shown in fig. 11, a node number 4 is used to store a third key 28 that is a duplicate of the first key 28 of Node number 1 and that corresponds to data p3&p4. The node number 4 is represented as the second data (fig. 11, col. 2, lines 49-55);

Hara does not explicitly teach the claimed limitation "separately from the root node, index node and leaf node; wherein the first key points to the second key; wherein the second key points to the third key".

Bredenberg teaches storing data pages 810 which comprise a table separately from nodes of a B-tree (col. 30,lines 34-45; 29, lines 32-45). Key or pointer of node 601 points to key of node 603 and key of 603 points to key of 601 (fig. 6; col. 8, lines 10-65).

It would have been obvious to a person of an ordinary skill in the art at the time the invention was made to apply Bredenberg's teaching of storing data pages 810 which comprise a table separately from nodes of a B-tree. Key or pointer of node 601 points to key of node 603 and key of 603 points to key of 601 to Hara's system in order to avoid a deadlock from occurring with a transaction structurally modifying the arrangement of records in the tree during searching/retrieving records in a tree, save

memory space, provide a fast method by using forward operations of linked keys for searching/retrieving records in a database and further to permit a B-tree to be concurrently traversed for the purpose of reading while the B-tree is actually in the process of restructuring.

As to claim 34, Hara does not explicitly teach the claimed limitation "wherein the third key points to the second key; wherein the second key points to the first key".

Bredenberg teaches a second key points to first key and a third key points to second key (figs. 6-7, col. 28, lines 5-25)

It would have been obvious to a person of an ordinary skill in the art at the time the invention was made to apply Bredenberg's teaching of a second key points to first key and a third key points to second key to Hara's system in order to permit a B-tree to be concurrently traversed for the purpose of reading while the B-tree is actually in the process of restructuring.

7. Claims 2 and 4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hara (US 6571250) in view of Bredenberg (US 5918224) and further in view of Li (US 6647381).

As to claim 2, Hara teaches the claimed limitation "werhein the data pages include the first data page having the second key and a second data page having the third key" as (fig. 11).

Hara does not explicitly teach the claimed limitation "wherein said first data page and second data page comprise the same page".

Li teaches the same page (col. 10, lines 1-5).

It would have been obvious to a person of an ordinary skill in the art at the time the invention was made to apply Li's teaching of the same page to Hara's system in order to backup the system when a page in the system is corrupted.

As to claim 4, Hara teaches the claimed limitation "wherein the data pages include the first data page having the second key and a second data page having the third key, wherein the second data page includes second data" as (fig. 11).

Hara does not explicitly teach the claimed limitation "wherein said first data and second data are the same".

Li teaches the same page (col. 10, lines 1-5).

It would have been obvious to a person of an ordinary skill in the art at the time the invention was made to apply Li's teaching of the same page to Hara's system in order to backup the system when a page in the system is corrupted.

Conclusion

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Reiter et al (US 5752243).

9. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Contact Information

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Cam Y T. Truong whose telephone number is (571) 272-4042. The examiner can normally be reached on Monday to Firday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John Breene can be reached on (571) 272-4107. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Cam Y Truong
Primary Examiner
Art Unit 2162